Project E-233-24

THE FEASIBILITY OF PRODUCING SOUTHERN PINE PLYWOOD IN GEORGIA

by

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Foreword

During the course of this study, interviews with industrialists have revealed immediate and unusually strong interest in the potentials which exist for the construction of Southern pine plywood plants in Georgia.

For this reason the present report has been rushed to a "shorthand" completion which has omitted some materials which were originally planned to be part of the study. As with earlier analyses which have triggered such strong industrial interest, we have therefore felt it desirable to publish a report which provides needed information without completing the more exhaustive analysis which would have been carried out had time permitted.

Additional and more detailed information of interest to individual companies will be prepared on a confidential basis if requested. Comments and inquiries regarding the study are invited.

Kenneth C. Wagner, Chief
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Acknowledgments

It is impossible to acknowledge individually all the help received during the writing of this report. To ensure the accuracy of the wide range of data presented in this study, a large number of professional people in the following fields were contacted:

forestry,
wood technology,
machinery,
chemical engineering,
plywood manufacturing and trade,
lumber production and sales,
railroad transportation, and
industrial development.

A number of trade associations also were contacted.

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Thanks are also due to the Douglas Fir Plywood Association for providing marketing data and to Atlantic Coast Line Railroad Company and Southern Pacific Lines for providing freight rates on plywood shipments.

None of the sources whose contributions have been acknowledged should be held accountable for interpretations placed upon information or comments they may have provided. The sole responsibility for the report must rest with the author.

Summary

The technological breakthrough in drying and gluing of Southern pine plywood and the development of new equipment for use on small logs have permitted two large Southern pine plywood plants to be built in the South for the first time. Additional plants are being planned. It is predicted that production capacity in the South may reach three billion square feet a year in the next few years.

Southern pine plywood, with product quality and production costs comparable with those of Douglas fir plywood, can be produced 1,000 to 2,000 miles closer to major markets. This means that transportation costs will be $10 to $15 per thousand square feet less than those for Douglas fir plywood. This reason alone will assure its dominant position in the market. Currently Southern pine plywood producers intend to make only sheathing grades, which account for approximately 50% of the nearly 10 billion square feet of softwood plywood consumed annually in the United States.

Georgia leads the South in total Southern pine saw timber volume. It is a close second to Arkansas in volume of pine saw timber with a diameter range between 14 and 18 inches, the most suitable diameter range for plywood manufacture. Georgia is foremost in the diameter range from 10 to 12 inches, the range which will be the largest source of saw timber suitable for plywood in the near future. Fifteen locations in Georgia are identified in this study as possible sites for plywood plants, each with an annual net growth of Southern pine saw timber within a 50-mile radius ranging from 300 million board feet to 660 million board feet. Waycross, Jesup, Thomasville, Monticello, and Douglas are the leading cities in standing saw timber volume.

The area in which a Georgia producer of Southern pine plywood would have a freight advantage over western plywood producers lies east of a line connecting Minneapolis, Sioux City, Omaha, Wichita, Oklahoma City, and El Paso. The consumption of softwood plywood in this freight advantage area was estimated at 6.9 billion square feet in 1962, of which 3.6 billion square feet were sheathing grades. This was 72% of total U. S. consumption of all grades as well as sheathing grades in that year.

Investment costs of a Southern pine plywood plant with an annual production of 50 million square feet of sheathing-grade plywood on a 3/8-inch thickness basis are estimated at $1,517,700 for all equipment, $475,500 for land and buildings, and $782,000 for working capital. The production cost of Interior C-D grade is estimated at $48.96 per thousand square feet of 3/8-inch plywood. The current sale price in Atlanta is $71.24 per thousand square feet. Based on a mill price of $65 per thousand square feet, net profit after taxes would be $442,160 a year. The payout period would be five years.

The total consumption of softwood plywood in the nation was estimated at 9.5 billion square feet in 1962. The Midwest consumed 27% of this total, the South 25%, the Pacific Coast 22%, the Mid-Atlantic Coast and New England 20%, the Mountain states 5%, and others 1%. Residential construction accounted for 60% of the total consumption, non-residential construction 15%, industrial use 16%, "do-it-yourself" uses 7%, and agriculture 2%. Sales to wholesalers accounted for 90% of manufacturers' shipments, retailers 7%, and final users 3%.

INTRODUCTION

Since the favorable conditions existing in Georgia seem likely to attract a number of Southern pine plywood plants, this study was initiated to provide basic information pertinent to the establishment of a Southern pine plywood industry in the state.

The objectives of the study are as follows:

1. To provide up-to-date information on Southern pine plywood development.
2. To present detailed investment costs for an efficient-size plant operation in Georgia.
3. To estimate possible production costs and profits for such a plant.
4. To present a freight analysis which will indicate the freight advantage area for Georgia-based plants.
5. To give detailed estimates on plywood consumption in each major marketing district.
6. To present an over-all picture of the softwood plywood industry in the United States.

Since the large-scale production of Southern pine plywood is a relatively new development, an over-all analysis of this product is given first, followed by a section on production economics which deals with rational uses of timber resources, plant capacity, production costs, and possible profits.

Georgia's advantages as a center for Southern pine plywood production are discussed next. Included are a comparison of timber resources in the southern states, identification of 15 potential plant locations in Georgia, and an analysis of the Georgia freight advantage area.

The following section presents information on softwood plywood distribution and marketing practices, including a discussion of the distribution system, end uses, regional distribution, and pricing considerations. The report concludes with an analysis of the possible impact of Southern pine plywood manufacture on the plywood industry.

DEVELOPMENT, MANUFACTURE, AND END USES
OF SOUTHERN PINE PLYWOOD

Current State of Southern Pine Plywood Development

Southern pine plywood has been produced commercially in the South for many years. It has been made in small plants which were planned for the production of hardwood plywood or other wood products and which were not designed to compete with the modern softwood plants in the West. Today large Southern pine plywood plants with production efficiency comparable with that of most modern plywood plants in the West are being planned and built. Conditions which led to this change are briefly discussed here.

After 50 years of extensive cutting, the virgin timber stand of Douglas fir is only two-fifths of its original size. The high stumpage cost and rising price of peeler log have forced Douglas fir plywood plants to use lower grade and smaller logs for manufacture. New equipment is being developed for smaller saw logs and new wood species are being sought for softwood plywood manufacture.

The development of sheathing-grade plywood, which is made mainly of lower grade Douglas fir saw logs, has expanded enormously the use of Douglas fir in building and construction, at the expense of Southern pine lumber. Although top grade Southern pine lumber still is in good demand and commands a premium price, the market for common grade Southern pine lumber has been deeply hurt by the inroads of western lumber and plywood. An urgent need for new outlets for lower grade Southern pine saw logs has existed for a long time. The recent technical advances in gluing and drying processes for Southern pine plywood have paved the way for the establishment of a giant new wood-based industry in the South.

According to informed sources, the quality and production costs of Southern pine plywood will be comparable with those of Douglas fir plywood. Produced in close proximity to major markets, Southern pine plywood will have a comfortable margin in transportation cost over Douglas fir plywood. This reason alone will assure its dominant position in the softwood plywood market. At this beginning stage, Southern pine plywood is reported to be made in sheathing grades only. The sheathing-grade market accounts for approximately 50% of the total annual plywood consumption in the United States of nearly 10 billion square feet.

Two Southern pine plywood plants are presently under construction in the South. The South's first pine plywood plant, with a capacity of 90 million square feet a year, is being built at Fordyce, Arkansas, by the Georgia-Pacific Corporation. Another plant, with a capacity of 100 million square feet a year, is a joint venture of the United States Plywood Corporation and Southern Pine Plywood Company at Diboll, Texas. It is estimated that four to five more plants may be announced within a year.

Georgia, with the largest pine saw timber volume in the South, is an excellent location for a new Southern pine plywood manufacturing plant.[1/] Several companies and a number of local groups in Georgia are taking steps to establish a pine plywood industry in the state.

Due to the similarity of products, end uses, markets, and distribution channels of Southern pine and Douglas fir plywood, the two announced Southern pine plants are applying for membership in the Douglas Fir Plywood Association which, as a compromise, plans to change its name in order to represent all softwood plywood producers in the United States. This is an indication that the producers of Southern pine plywood and Douglas fir plywood may complement each other in production and in marketing. Producers of Southern pine plywood probably will concentrate on sheathing grades, while producers of Douglas fir plywood may give emphasis to clear or sanded grades.

In anticipation of the rapid expansion of Southern pine plywood manufacture in the South, commercial standard grades have been approved recently by the U. S. Department of Commerce and will be validated for use on November 15, 1963. No other wood product has had the benefit of so much planning and preparation prior to the commencement of actual production.

Advantages of Southern Pine Plywood Manufacture

Two major advantages of Southern pine plywood manufacture over plywood production in the West are proximity to major markets and more abundant timber resources. Transportation costs of southern plywood mills, which are 1,000 to 2,000 miles closer to major markets, will run about $10 to $15 per thousand square feet less than those of plywood plants located in the West. According

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1/ See section on "Georgia as a Center for Southern Pine Plywood Manufacture."

to actual plywood shipping records, 73% of the market is closer to southern plants than to those in the West.

In the next 20 years, the virgin timber supply in the West may be exhausted, with the exception of the reserves of big companies which have sufficient forest land to coordinate production with the 80-year growth cycle of Douglas fir. In contrast, Southern pine matures for saw timber cutting in 30 to 35 years, and its supply has been increasing despite heavy cutting for pulpwood.

Labor costs are cheaper in the South, although this advantage is offset by the greater yield of the larger diameter logs available in the West. Stumpage prices are reported about the same in the two areas.

Manufacturing Procedure

Southern pine plywood is manufactured in basically the same way as Douglas fir plywood. The selection of machinery, plant layout, and glue used may be different from one plant to another, but the basic principle and production procedure are the same.

Plywood plants are nearly all single-story, wide-aisle, timber-framed structures with concrete floors and built-up roofs. The tendency is toward the use of glued laminated beams and columns.

There are nine major steps in manufacturing Southern pine plywood. These steps are briefly discussed here.

Peeling. Actual work on the block begins on the lathe, which cuts the veneer to the thickness required. Lathes come in various sizes, although eight feet is the common size. The lathe is one of the most important pieces of equipment in the plywood plant because a variation in thickness would adversely affect the profit of the plant. Retractable chucks are used so that the block may be peeled down to a four-inch diameter.

Clipping. The peeled veneer passes to the trays, which are moving belts running at the speed of the block. The veneer is drawn to the clippers, which cut it into pieces.

Green veneer storage and drying. Veneer pieces are pulled manually from the chain, following the clipping operation, and stored prior to drying.

Storage of green veneer consists only of those steps necessary to classify and prepare runs for the dryer. Veneer pieces with different densities and moisture content run through the dryers at different speeds.

Dry sorting. Dry sorting is generally done by pulling veneer manually from the belt after grading and sorting.

Patching and makeup. Defects, splits, and knot holes, which develop when the veneer goes through the lathe and dryer, are patched and smoothed by automatic machines.

Gluing. After patching and makeup, veneer pieces are assembled and stored ready for lay-up at the glue spreader. Phenolic or other types of glue are used for Southern pine plywood. Faces are made in one piece by edge-jointing the pieces on a jointer and then gluing them together using radio frequency heating.

Pressing. The pressing operation is a critical one, because it is at this point that the component parts which make up the sandwich are united into one complete whole. Temperatures, pressures, and timing must be carefully controlled.

Trimming, sanding, repatching, and finishing. After leaving the press, veneer panels are taken to the skinner and cut-off saws, where they are automatically loaded into a machine which edge saws the veneer panels to width and end-trims them to length. Sheathing grades are stamped with appropriate designs on the face. Clear grades are sanded and repatched.

Storage and shipping. Finally, veneer panels are stored, usually within the same building and under cover, and then shipped.

Commercial Standard Grades and End Uses

Two types (Interior and Exterior) and 21 grades of Southern pine plywood have been approved by the U. S. Department of Commerce as standards for commercial uses. There are six major grades in each type. These grades and their descriptions are listed in Table 1.

Detailed grades in the Interior and Exterior types and the minimum quality of their veneers are given in Table 2 and Table 3. Recommended end uses of specific grades are given in Table 4 for Interior types and in Table 5 for Exterior types.

Table 1

GRADE DESCRIPTIONS OF INTERIOR AND EXTERIOR TYPES
OF SOUTHERN PINE PLYWOOD

Grade	Description
N	Special order "natural finish" veneer. Select, all heartwood. Free of open defects.
A	Best standard veneer. Smooth and paintable. May be more than one piece, well jointed. Neatly made repairs permitted.
B	Solid surface veneer. Circular repair plugs and tight knots permitted.
C	Minimum veneer permitted in Exterior type. Knotholes to 1", splits, plugs, and other repairs permitted.
C-Plugged	Improved "C" veneer.
D	Used only in Interior type for inner plies and backs where specified.

Table 2

MINIMUM QUALITY OF VENEERS FOR INTERIOR-TYPE PLYWOOD GRADES

Interior Grades	Face	Back	Inner Plies	Additional Limitations
N-N, Int. (natural finish 2 sides)	N	N	C	Sanded 2 sides
N-A, Int. (natural finish)	N	A	C	Sanded 2 sides
N-D, Int. (natural finish 1 side)	N	D	D	Sanded 2 sides
A-A, Int.	A	A	D	Sanded 2 sides
A-B, Int.	A	B	D	Sanded 2 sides
A-D, Int.	A	D	D	Sanded 2 sides
B-B, Int. (concrete form, Int.)	B	B	C	Sanded 2 sides, edge-sealed and otherwise specified mill-oiled
B-B, Int.	B	B	D	Sanded 2 sides
B-D, Int.	B	D	D	Sanded 2 sides
Int. Underlayment	C-Plugged	D	C and D	Sanded 2 sides or touch-sanded
C-D (Plugged), Int.	C-Plugged	D	D	Unsanded or touch-sanded
C-D, Int. (Sheathing, Int. with Exterior glue)	C	D	D	Unsanded grade
C-D, Int. (2-4-1)	C	D	D	Unsanded grade

Source: Southern Pine Plywood, Commercial Standard, CS259-63, U. S. Department of Commerce, Washington, D. C., 1963

Table 3

MINIMUM QUALITY OF VENEERS FOR EXTERIOR-TYPE PLYWOOD GRADES

Exterior Grades	Face	Back	Inner Plies	Additional Limitations
Special Ext.				One of A-A, A-B, and B-B grades with modification
A-A, Ext.	A	A	C	Sanded 2 sides
A-B, Ext.	A	B	C	Sanded 2 sides
A-C, Ext.	A	C	C	Sanded 2 sides
B-B, Ext. (concrete form, Ext.)	B	B	C	Edge-sealed and, unless otherwise specified, mill-oiled, sanded 2 sides
B-C, Ext.	B	C	C	Sanded 2 sides
C-C, Ext. -- Plugged	C-Plugged	C	C	Sanded 2 sides or touch-sanded
C-C, Ext. (Sheathing, Ext.)	C	C	C	Unsanded grade

Source: Southern Pine Plywood, Commercial Standard, CS259-63, U. S. Department of Commerce, Washington, D. C., 1963

Table 4

RECOMMENDED END USES OF INTERIOR-TYPE PLYWOOD

Grade	Description and End Uses
N-N, Int. (natural finish 2 sides)	Cabinet work, generally only in 3/8" thickness.
N-A, Int. (natural finish)	Kitchen cabinets, fixtures, and paneling.
N-D, Int. (natural finish 1 side)	Paneling and wainscoting, generally only in 1/4" thickness.
A-A, Int.	For interior applications where both sides will be viewed. Shelving and partitions.
A-B, Int.	For use similar to Int. A-A panels, but where the appearance of one side is less important.
A-D, Int.	Interior use where appearance of only one side is important. Flow racks.
B-B, Int. (concrete form, Int.)	Re-usable concrete form plywood. Glue moisture-resistant, not waterproof.
B-B, Int.	Utility panel. Used where two smooth sides are required.
B-D, Int.	Utility panel. Used where one smooth side is required. Separator boards and bins.
Underlayment, Int.	Base for tile, linoleum, carpeting and backing material for interior use.
C-D (plugged), Int.	Unsanded sheathing or structural grade fir plywood. Crating and dunnage.
C-D, Int. (with exterior glue)	Same as Plugged above, but with water-proof glue.
C-D, Int. (2-4-1)	Combination subfloor and underlayment. Base for tile, linoleum, carpeting, and wood strip flooring. Available in square edges or tongue and grooved. Industrial decking.

Table 5

RECOMMENDED END USES OF EXTERIOR-TYPE PLYWOOD

Grade	Description and End Uses
Special Ext.	End use will be same as A-A, A-B, or B-B.
A-A, Ext.	Used where the appearance of both sides is important. Fences, carports, signs, boats, cabinets, refrigerators, shipping containers, tote boxes, and ducts.
A-B, Ext.	For uses similar to A-A, Ext., but where the appearance of one side is less important.
A-C, Ext.	Used where the appearance of only one side is important. Liquid tanks, containers, and industrial trays.
B-B, Ext. (concrete form, Ext.)	Concrete form grade, maximum re-use.
B-C, Ext.	An outdoor utility panel. For farm and work buildings, box car and truck linings.
C-C, Ext. -- Plugged	Used as a base for tile, linoleum, carpeting, where unusual moisture conditions exist. Reel heads.
C-C, Ext. (sheathing, Ext.)	Unsanded grade with waterproof bond. Best for backing, rough construction, farm buildings, crating.

Sheathing grades, which producers of Southern pine plywood intend to make at the beginning stage, include:

Int. Underlayment
Int. C-D (Plugged)
Int. C-D (Int. sheathing with Exterior glue)
Ext. C-D (Plugged)
Ext. C-C (Ext. sheathing)

Although Int. C-D (2-4-1) is considered as one of the sheathing grades, it requires special finishes and comes in special sizes. Therefore, producers probably will not manufacture this grade at the beginning stage.

PRODUCTION ECONOMICS OF SOUTHERN PINE PLYWOOD

Rational Uses of Timber Resources

Today the stand of Douglas fir timber is only two-fifths of its original size; in contrast, the stand of Southern pine has been increasing by two billion board feet a year. Because of the ever-increasing demand and heavy cutting, the virgin stand of Douglas fir may be exhausted after 20 years. New growth of Douglas fir timber no doubt will affect future supply, but it takes 80 years to reach 18 to 20-inch diameter. On the other hand, Southern pine takes only 35 years to reach a diameter range of 14 to 16 inches. In terms of reproduction rate, Southern pine has an advantage.

The Southern pine lumber industry has been in a depressed condition for a long time because of the heavy inroads of western lumber and plywood in the eastern markets. In view of the diminishing supply of Douglas fir timber and the rapid increase in Southern pine saw timber, it would be rational, from a national timber-use standpoint, to substitute the latter for the former wherever possible.

From a regional point of view, the manufacture of Southern pine plywood in the South is also a rational move. The manufacture of sheathing grades requires only No. 2 and No. 3 pine saw logs, leaving the top grade for the manufacture of premium-priced lumber. It is reported that, at the present time, production of low-grade pine lumber is not profitable. Therefore, shifting the use of low-grade timber for the production of sheathing-grade plywood, which has a ready market, would be a logical move. The left-over core stocks from veneer production could be made into wood chips, which has a ready market in the South.

Plant Capacity and Investment Costs

A Southern pine plywood plant must be designed to operate efficiently on relatively small logs, in a diameter range from 9 to 18 inches. Plant capacity depends on timber supply, the type of product made, and other economic considerations. Thirty-five to 50 million square feet a year is considered the minimum range of economical production.

Machinery selection must be a combined effort of the designer, operator, and owner. Balance and flexibility are the two major aims of machine selection

and plant layout. Estimated investment costs for a Southern pine plywood plant with an annual capacity of 50 million square feet on a 3/8-inch thickness basis are given in Table 6 and Table 7. The estimates serve only as a broad indication of investment costs involved for a plant of such size.

Production Costs and Possible Profits

Production costs and profits in any industry vary from one plant to another because of differences in production and sales efficiency, in plant size, and in management and pricing policies. However, data on Southern pine plywood obtained through various sources can give a broad indication of likely costs and profits for a plant producing 50 million square feet of 3/8-inch plywood a year. A typical operation is based on two shifts per day and 250 working days a year.

In estimating the production costs and possible profits of a typical Southern pine plywood plant, several pertinent facts and assumptions must be taken into consideration. Yield of blocks or saw logs is based on test-run records of several big corporations. The yield range is 2.4 to 3 square feet per board foot in log scale. The median, 2.6, is used in this illustration.

This study assumes the use of Exterior-type glue (phenolic). The use of Exterior glue in the manufacture of Interior sheathing grades is recommended to promote initial sale of Southern pine plywood in the market. The price of Exterior glue is higher than that of Interior glue, but the cost can be absorbed by the freight advantage that the southern producers will have over western manufacturers.

Profits from the sale of wood chips made from core stocks of veneer blocks are estimated to be $5.00 per ton on the basis of a yield of two tons of wood chips per thousand board feet of logs consumed. It is assumed that the chips will be sold in Georgia exclusively.

Plywood prices are sensitive to fluctuations in supply and demand in the market. During the summer of 1963, when the construction business was in full swing, the price of Int. C-D (3/8-inch thickness) hovered around $80.00 per thousand square feet in Atlanta. The price for this grade as of October 22, 1963, was $71.24 per thousand square feet. Int. C-D with Exterior glue is $5.00 more per thousand square feet (3/8-inch thickness) than Int. C-D.

Table 6

ESTIMATED FIXED INVESTMENT IN LAND, BUILDING,
AND EQUIPMENT FOR A SOUTHERN PINE PLYWOOD PLANT

(Based on Annual Production of 50 Million Square Feet, 3/8")

Equipment	Number	Estimated Installed Cost
Block and log handling equipment to vats		$ 25,000
Vats for heating blocks	8	40,000
Block-handling equipment from vats to lathe charger conveyor		20,000
Block conveyor with motor drive	1	5,200
Coe automatic centering device and lathe charger, Model 762-A	1	25,000
110" knife-length M-249 Coe dual spindle lathe	1	68,500
125-150 H. P. AC-DC lathe drive	1	30,000
Model 659 lathe backup roll	1	6,500
Six deck, 150 ft. long Coe veneer conveying tray system and grading table	1	45,000
AC-DC tray system drive	1	15,000
113" Model 346 Coe automatic air clippers	2	36,000
Upper clipper supporting structure	1	4,500
Scrap veneer conveyor under tray system	1	8,000
Scrap veneer conveyor	1	6,500
Core conveyor from lathe	1	4,000
Wet veneer chipper	1	24,500

Table 6 (continued)

Equipment	Number	Estimated Installed Cost
Core chipper	1	$ 16,000
Blow system from chippers to car	1	16,000
Model 431 Coe automatic knife grinder	1	5,900
Coe dryer feeders	2	51,000
Coe roller veneer dryers, steam heated	2	374,000
Coe automatic dryer unloaders	2	33,000
Automatic moisture detecting systems	2	13,000
Dryer unloader conveyors	2	9,000
Dryer veneer sorting tables	2	6,000
110" knife-length Coe dry sizing clippers	2	5,500
Patch blanking saw	1	2,500
Veneer patchers with gravity rolls	2	29,000
Veneer patcher scissors lifts	2	2,200
Core saw	1	6,500
Automatic heavy duty jointer	1	29,000
Continuous edge gluer with automatic cut-off clipper	1	29,500
Overhead glue mixers	2	6,500
Glue spreaders	2	12,000
Fish tail saw	1	3,500
Williams-White hot plate press	1	94,000
Hydraulic elevators at hot plate press	2	17,500
Hot press load trim band saw	1	1,100

Table 6 (continued)

Equipment	Number	Estimated Installed Cost
Hot plate press loader	1	45,000
Hot plate press receiving rack	1	3,800
Set of gravity rolls between spreaders and press	1	1,100
High speed double trim saw, including transfer section	1	39,500
High speed combination belt sander	1	42,500
Sawdust collecting system	1	24,000
Hog for dry veneer and panel trim scrap	1	12,200
Incinerator for dry veneer and panel trim scrap	1	12,300
Conveyor for scrap veneer hog	1	6,500
Tow-motor fork lift trucks	3	27,000
Air compressor and tank	1	8,000
Glue storage tank	1	11,000
Equipment for panel oiling	1	6,000
Miscellaneous mill trucks and pallets		2,500
Contingencies		100,000
Total installed equipment		$1,467,700
Land		5,000
Land preparation		25,000
Building		445,500
Total estimated fixed investment (not including working capital)		$1,943,200

Notes: Land cost is based on a requirement of 25 acres of land at $200 per acre. Building cost is based on a requirement of 99,000 square feet of floor space at $4.50 per square foot.

Table 7

ESTIMATED WORKING CAPITAL INVESTMENT
FOR A SOUTHERN PINE PLYWOOD PLANT

(Based on Annual Production of 50 Million Sq. Ft., 3/8")

Items	Estimated Investment
One month's glue supply	$ 18,000
Three months' log supply	264,000
One month's finished goods	250,000
One month's invoices payable	250,000
Total	$ 782,000

Because of variations in distance to market and differences in sale price from region to region, it is logical for a Southern pine plywood producer to set mill prices in such a way as to yield maximum profits from production. Four different mill prices on a per thousand square feet basis ($55, $60, $65, and $70) are used in this study.

Details on production costs and possible profits for a Southern pine plywood plant with annual production of 50 million square feet on a 3/8-inch basis are given in Table 8 and Table 9. The data which form the basis for calculations are given below.

Basic Data For Calculations

1.	Yield	2.6 square feet/board feet
2.	Block cost	$55.00/thousand board feet, delivered
3.	Glue (phenolic)	$4.40/thousand square feet
4.	Labor	$1.50/hour; $8.57/thousand square feet; 175 square feet/man-hour
5.	Fuel, power, and water	$1.50/thousand square feet
6.	Factory supplies	$1.00/thousand square feet -- sandpaper, shipping supplies, etc.
7.	Factory overhead	

Management salaries = 1 @ $20,000; 2 @ $15,000	$50,000
Administrative and clerical = 2 @ $8,000; 1 @ $4,000	20,000
Office supplies	5,000
Miscellaneous labor charges	20,000
	$95,000

8. Maintenance — $50,000 -- 1 man @ $7,000 per year, 3 men @ $5,000 per year, and 7 men @ $4,000

9. Depreciation — 10% annually

10. Sales expenses — 7% of gross sales -- functional discount 5% and cash discount 2%

11. Taxes and insurance — 4.3% annually on estimated plant value

12. Present 3/8-inch plywood cost per thousand square feet, delivered to Atlanta, on October 22, 1963, with all discounts included

Int. C-D		
	Mill	$52.28
	Freight	18.96
	Atlanta delivered	$71.24
Int. C-D (with Exterior glue)		
	Mill	$57.28
	Freight	18.96
	Atlanta delivered	$76.24

13. Corporation taxes

Federal	52% of net income
State	4% of net income derived from sales in the state. (It is assumed that 1/3 of the annual sales of the proposed plant would be in Georgia.)

14. Chip yield — Approximately 2 tons of chips per thousand board feet. Chip sales price is $5.00 to $6.00/ton. Production costs usually are charged to the main product (plywood). Delivery costs may be borne by either the producer or the purchaser, depending upon the sales price.

Table 8

ESTIMATED COSTS AND PROFITS OF TYPICAL SOUTHERN PINE PLYWOOD PLANT

(Based on annual production of 50 million square feet, 3/8" thickness, and on 2-shift operation, 250 days per year)

		Mill Sale Price (f.o.b. mill/1,000 square feet):			
		$55.00	$60.00	$65.00	$70.00
Gross Sales		$ 2,750,000	$ 3,000,000	$ 3,250,000	$ 3,500,000
Variable Costs	Per 1,000 sq. ft.				
Logs	$21.15	$ 1,057,700	$ 1,057,700	$ 1,057,700	$ 1,057,700
Glue	4.40	220,000	220,000	220,000	220,000
Direct Labor	8.57	428,500	428,500	428,500	428,500
Fuel, Power, Water	1.50	75,000	75,000	75,000	75,000
Factory Supplies	1.00	50,000	50,000	50,000	50,000
Total Variable Costs	$36.62	$ 1,831,200	$ 1,831,200	$ 1,831,200	$ 1,831,200
Variable Profit		$ 918,800	$ 1,168,800	$ 1,418,800	$ 1,668,800
Fixed Costs					
Out-of-Pocket Fixed Costs					
Factory Overhead		$ 95,000	$ 95,000	$ 95,000	$ 95,000
Maintenance		50,000	50,000	50,000	50,000
Sales Expenses		192,500	210,000	227,500	245,000
Property Taxes and Insurance		82,268	82,268	82,268	82,268
Total Out-of-Pocket Fixed Costs		$ 419,768	$ 437,268	$ 454,768	$ 472,268
Cash Income		$ 499,032	$ 731,532	$ 964,032	$ 1,196,532
Non-Fund Fixed Cost					
Depreciation		$ 196,320	$ 196,320	$ 196,320	$ 196,320
Net Income before Taxes		$ 302,712	$ 535,212	$ 767,712	$ 1,000,212
Chip Credit		$ 192,310	$ 192,310	$ 192,310	$ 192,310
Total		$ 495,022	$ 727,522	$ 960,022	$ 1,192,522

Table 9

SUMMARY STATEMENT OF ESTIMATED COSTS AND PROFITS OF TYPICAL SOUTHERN PINE PLYWOOD PLANT

(Based on annual production of 50 million square feet, 3/8" thickness, and on 2-shift operation, 250 days per year)

	Mill Sale Price (f.o.b. mill/1,000 square feet):			
	$55.00	$60.00	$65.00	$70.00
Income:				
Gross Sales	$ 2,750,000	$ 3,000,000	$ 3,250,000	$ 3,500,000
Variable Costs	1,831,200	1,831,200	1,831,200	1,831,200
Variable Profit	$ 918,800	$ 1,168,800	$ 1,418,800	$ 1,668,800
Out-of-Pocket Fixed Costs	419,768	437,268	454,768	472,268
Cash Income	$ 499,032	$ 731,532	$ 964,032	$ 1,196,532
Depreciation	196,320	196,320	196,320	196,320
Net Income before Taxes	$ 302,712	$ 535,212	$ 767,712	$ 1,000,212
Chip Credit	192,310	192,310	192,310	192,310
Total	$ 495,022	$ 727,522	$ 960,022	$ 1,192,522
Taxes				
Federal	$ 257,411	$ 378,311	$ 499,211	$ 620,111
State	12,308	15,484	18,651	21,817
Net Income	$ 225,303	$ 333,727	$ 442,160	$ 550,594
Investment:				
Fixed Investment	$ 1,993,200	$ 1,993,200	$ 1,993,200	$ 1,993,200
Working Capital	782,000	782,000	782,000	782,000
Total Investment	$ 2,775,200	$ 2,775,200	$ 2,775,200	$ 2,775,200
Per Cent Return on:				
Fixed Investment	11.30	16.74	22.18	27.62
Total Investment	8.12	12.02	15.93	19.84
Payout Period (with depreciation included)	9 years	6 years	5 years	4 years

GEORGIA AS A CENTER FOR SOUTHERN PINE PLYWOOD MANUFACTURE

Availability of Southern Pine Saw Timber

Southern pine, or yellow pine, is defined for the purpose of manufacturing plywood as the species of longleaf (Pinus palustris), slash (P. elliottii), shortleaf (P. echinata), and loblolly (P. taeda).[1/] All these four species exist in Georgia. With longleaf and slash pine in the southeast and loblolly and shortleaf pine in the middle part, Southern pines cover 51% of all commercial forest acreage and account for 53% of all growing stocks on commercial forest land in the state.

Southern pine saw timber used for plywood manufacture may have a diameter range from 9 to 30 inches. Diameters of 14 to 18 inches are considered very good. An average diameter of 15 inches, with a minimum of 10 to 11 inches, is now considered adequate by plant designers, provided retractable chucks are installed to handle the core blocks efficiently at the lathe.

The net volume of Southern pine saw timber in the southern states is given in Table 10 by diameter classes. Georgia leads the South in total net volume of Southern pine saw timber. It is a close second to Arkansas in the diameter range between 14 and 18 inches, the most suitable diameter range for Southern pine plywood manufacture. Georgia is foremost in the diameter range from 10 to 12 inches, the range which will be the largest source of saw timber for Southern pine plywood in the near future.

Of Georgia's 8,592,200 acres of commercial forest land in saw timber stand size, 6,338,400 acres (74%) are under farm and private ownership, and 1,331,200 acres (15%) are under forest industry ownership. In other words, pulp and paper companies own less than 15% of all saw timber land in Georgia, or less than 21% of all privately owned saw timber land. Details of Georgia's commercial forest land by stand size and ownership classes are given in Table 11.

1/ Southern Pine Plywood, Commercial Standard, CS259-63, U. S. Department of Commerce, Washington, D. C., 1963.

Table 10

NET VOLUME OF SOUTHERN PINE SAW TIMBER
BY DIAMETER CLASS IN THE SOUTHERN STATES

(in million board feet)

State	Year	10"-12"	14"-18"	20"-24"	25"+	Total
GEORGIA	1961	15,241.2	9,589.7	1,459.2	55.1	26,345.2
North Carolina	1955	11,655.5	9,532.6	1,942.0	255.5	23,386.1
Arkansas	1959	9,288.1	10,943.7	2,798.3	290.1	23,320.2
Alabama	1953	10,477.5	8,723.9	2,210.5*		21,411.9
Louisiana	1954	6,046.7	9,040.6	2,682.7*		17,770.0
Texas	1955	7,091.0	7,998.9	1,994.5*		17,084.4
South Carolina	1958	5,805.6	6,142.9	1,911.8*		13,660.3
Mississippi	1957	5,675.0	5,739.7	1,557.6*		12,972.3
Virginia	1957	6,096.3	4,099.7	723.9	34.0	10,953.9
Florida	1959	6,816.1	3,132.3	325.3*		10,273.7
Tennessee	1961	1,736.9	946.2	62.6*		2,765.7
Oklahoma	1956	1,019.0	912.5	61.2*		1,992.7

* 20" and up

Sources: Forest survey releases, Southeastern Experiment Station and Southern Experiment Station, Forest Service, U. S. Department of Agriculture.

Table 11

AREA OF COMMERCIAL FOREST LAND BY STAND SIZE
AND OWNERSHIP CLASSES, GEORGIA, 1961

(in thousands of acres)

Stand Size Class	All Ownerships	National Forest	Other Public	Forest Industry	Farmers and Misc. Private
Saw timber	8,592.2	472.1	450.5	1,331.2	6,338.4
Pole timber	4,720.8	161.6	178.0	724.7	3,656.5
Sapling and seedling	11,720.2	139.7	374.4	1,740.9	9,465.2
Nonstocked areas	739.0	--	64.6	149.6	524.8
All classes	25,772.2	773.4	1,067.5	3,946.4	19,984.9

Source: U. S. Department of Agriculture Forest Service Resource Bulletin SE-1, Southeastern Forest Experiment Station, Asheville, North Carolina, 1963, p. 23.

Potential Plant Locations in Georgia

Since a thorough analysis of plant location factors is beyond the scope of this study, only certain pertinent facts are considered in relation to the location of a Southern pine plywood plant in Georgia. Fifteen potential plant locations in Georgia have been selected, primarily on the basis of the large volume of pine saw timber within a 50-mile radius of each location. Secondary consideration was given to local interest, transportation lines, and the availability of electricity, gas, and water.

Each of the following cities offers promise as a location for a Southern pine plywood plant in Georgia: Brunswick, Columbus, Douglas, Dublin, Jesup, LaGrange, Macon, Monticello, Savannah, Statesboro, Thomasville, Union Point, Valdosta, Washington, and Waycross.

Statistics on commercial forest area, volume of softwood saw timber and growing stock, and estimated net annual saw timber growth within a 50-mile radius are given in Table 12 for each of the 15 selected Georgia locations. These statistics were compiled from the county data of Georgia, Alabama, Florida, and South Carolina. Softwood saw timber volume is given in the table because of the lack of Southern pine saw timber data on the county level in states other than Georgia. However, Southern pine generally accounts for 80% to over 90% of softwood saw timber or growing stock in most counties.

Estimated net annual growth of saw timber is based on the ratio of net annual growth of pine softwood saw timber to standing pine saw timber volume in Georgia. The Georgia ratio is used in the calculations of net saw timber growth in different locations.

The 15 locations given in Table 12 are arranged in the order of saw timber volume in each locality. Waycross and Jesup stand out in the group both in saw timber volume and in growing stock. They are followed by Thomasville, Monticello, and Douglas, with over five billion board feet of standing saw timber within a 50-mile radius of each.

Freight Advantage Area and Market Potentials

Based on the partial freight data used in this report, any location in Georgia will have a freight advantage over major plywood producing centers in the West in shipments to all cities along the Eastern Seaboard, in the

Table 12

COMMERCIAL FOREST AREA, VOLUME OF SOFTWOOD SAW TIMBER AND GROWING STOCK, AND ESTIMATED NET ANNUAL SAW TIMBER GROWTH IN A 50-MILE RADIUS OF EACH OF 15 GEORGIA LOCATIONS, 1961

Location	Area of Commercial Forest (in 1,000 Acres)	Volume of Softwood Saw Timber (in Million Bd. Ft.)	Volume of Softwood Growing Stock (in 1,000 Cords)	Estimated Net Annual Growth of Saw Timber (in Million Bd. Ft.)
Waycross	4,615.9	6,901.3	32,482	661.2
Jesup	4,363.5	6,586.2	30,917	632.3
Thomasville	4,167.2	5,693.4	19,228	532.0
Monticello	4,393.6	5,293.8	27,619	508.2
Douglas	3,923.9	5,232.4	24,247	503.5
Valdosta	3,311.9	4,925.0	18,648	465.2
Macon	4,389.6	4,837.2	23,641	464.0
Washington	4,116.9	4,621.7	25,661	404.6
Statesboro	3,698.6	4,617.3	19,479	417.1
Union Point	3,549.5	4,203.7	23,519	403.6
Dublin	3,906.9	4,111.0	20,697	394.7
Columbus	4,415.5	4,108.0	17,680	377.9
Brunswick	2,729.1	3,850.2	18,162	368.3
LaGrange	4,147.1	3,539.1	16,534	327.4
Savannah	2,533.7	3,302.7	13,856	292.7

Sources: Forest survey releases for Georgia, Florida, Alabama, and South Carolina, Southeastern Experiment Station and Southern Experiment Station, Forest Service, U. S. Department of Agriculture.

Midwest, and in the South. Using Waycross, Georgia, as the center, a freight break-even line can be fixed to the west of Minneapolis, Sioux City, Omaha, Wichita, Oklahoma City, and El Paso. Any city east of this line is in the freight advantage area. (See Map 1.)

The softwood plywood shipments to this freight advantage area in 1962 were estimated at 6,852,894,000 square feet on a 3/8-inch thickness basis, or 72.5% of the total consumption in the United States. The shipments of sheathing-grade plywood to the freight advantage area in 1962 were estimated at 3,552,511,000 square feet on a 3/8-inch basis, or 71.9% of the total consumption of sheathing-grade plywood in the United States.

Shipments of softwood plywood in sheathing grades and all grades to a number of selected major trading areas in the freight advantage area are given in Table 13. Each trading area includes the major city listed as well as several smaller cities.

The sum of plywood shipments in Table 13 does not equal the total consumption of plywood in the freight advantage area because many smaller trading areas are omitted from the table.

MAP 1

FREIGHT BREAK-EVEN LINE AND MARKETING DISTRICTS OF SOFTWOOD PLYWOOD IN THE UNITED STATES, 1963

Industrial Development Division
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY

Table 13

SHIPMENTS OF SOFTWOOD PLYWOOD TO SELECTED MAJOR CITIES IN THE FREIGHT ADVANTAGE AREA, 1962

(in thousand square feet, 3/8" basis)

Trading Area	Sheathing Grades	All Grades
Atlanta, Ga.	91,822	186,334
Baltimore, Md.	57,600	107,394
Birmingham, Ala.	30,830	93,340
Boston, Mass.	124,317	254,177
Buffalo, N. Y.	69,035	130,173
Charlotte, N. C.	118,999	245,406
Chicago, Ill.	321,675	544,941
Cleveland, O.	66,707	150,306
Dallas-Ft. Worth, Tex.	102,328	218,909
Des Moines, Ia.	57,653	97,712
Detroit, Mich.	115,345	213,731
Houston, Tex.	50,830	119,006
Indianapolis, Ind.	85,004	145,283
Jacksonville, Fla.	40,876	79,910
Kansas City, Mo.	84,820	156,026
Memphis, Tenn.	40,557	99,582
Miami, Fla.	24,747	82,874
Milwaukee, Wis.	94,029	186,808
Minneapolis-St. Paul, Minn.	133,724	237,313
New Orleans, La.	61,263	159,873
New York, N. Y.	385,712	734,036
Omaha, Nebr.	57,160	113,278
Philadelphia, Pa.	113,018	229,979
Pittsburgh, Pa.	58,297	114,698
Richmond, Va.	45,899	84,548
St. Louis, Mo.	120,683	210,501
San Antonio, Tex.	50,564	97,612
Savannah, Ga.	23,775	48,057
Tampa, Fla.	47,312	115,188
Washington, D. C.	71,963	119,340

Source: Files of the Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology Atlanta, Georgia.

DISTRIBUTION OF SOFTWOOD PLYWOOD IN THE UNITED STATES

All of the 155 softwood plywood plants in the nation in 1962 were located in the West. In 1962, the total production of these plants was 9,463,287,000 square feet on a 3/8-inch thickness basis. The consumption was estimated at 9,459,287,000 square feet for all grades and 4,944,561,000 square feet for sheathing grades. The consumption estimate for all grades is based on domestic production plus 13,000,000 square feet of imports, minus 17,000,000 square feet of exports.

Four aspects of the distribution of softwood plywood in the United States are analyzed in this section: distribution by end uses, distribution by regions, marketing channels, and pricing practices.

Distribution by End Uses

In 1962, residential construction accounted for 60.4% of all consumption of sheathing-grade plywood. The remaining percentage was divided among non-residential construction, industrial uses, agricultural uses, and "do-it-yourself" uses. The details in footage and in percentage for each use are indicated in Table 14.

Table 14

DISTRIBUTION OF SHEATHING-GRADE SOFTWOOD PLYWOOD BY END USES IN THE UNITED STATES, 1962

End Uses	Square Feet in 3/8" Thickness	Per Cent of Total
Residential construction		
Roof sheathing	1,343,224,000	27.2
Wall sheathing	447,741,000	9.1
Subflooring	746,236,000	15.1
Subflooring underlayment	208,946,000	4.2
Underlayment	238,796,000	4.8
Subtotal	2,984,943,000	60.4
Non-residential construction	716,667,000	14.5
Industrial uses	797,222,000	16.1
Agricultural uses	113,706,000	2.3
"Do-it-yourself" uses	332,561,000	6.7
Total	4,944,561,000	100.0

Distribution by Regions

The regional consumption of softwood plywood in the United States in 1962 is given in percentages below:

Pacific	22.24
Mountain	4.96
Midwestern	26.93
Southern	24.84
Mid-Atlantic and New England	19.88
Others (Alaska, Hawaii, and exports)	0.85

Marketing Channels

The softwood plywood industry has a well-organized distribution system. The bulk of the commodity flows from mills in the West to wholesalers of different types strategically located throughout the nation. The flow continues from wholesalers to retailers and then to final users. Direct sales from mills to retailers and final users generally account for about 10% of total production. Details on market outlets for sheathing-grade softwood plywood are given in Table 15.

Table 15

MARKET OUTLETS FOR U. S. MANUFACTURERS' SHIPMENTS OF SHEATHING-GRADE SOFTWOOD PLYWOOD, 1962

Market Outlets	Volume (in 1,000 sq. ft., 3/8")	Per Cent of Total
Captive wholesaler with warehouse	1,508,091	30.5
Independent wholesaler with warehouse	1,953,102	39.5
Office wholesaler without warehouse	914,744	18.5
Commission wholesaler	98,891	2.0
Retailer	351,064	7.1
Final user	118,669	2.4
Total	4,944,561	100.0

The complex distribution system should not discourage a new Southern pine plywood producer. Many independent wholesalers would be interested in handling the output for a commission, probably 5% of sales. Even the large West Coast manufacturers with captive sales organizations would have the same interest; one large western corporation with a district office in Atlanta has indicated

such interest. A relatively small Southern pine plywood plant might be interested in such a program, while a plant producing over 35 million square feet might find it economically feasible to handle its own sales.

Pricing

Sheathing-grade plywood is the "bread-and-butter" item in the softwood plywood trade. Since the market is competitive, pricing is important. Test-run sheathing-grade plywood has been sold in the Atlanta market at the same price as Douglas fir plywood by several western corporations. Sales have been good, indicating an interest by customers in this new plywood. A new producer in Georgia might well consider initially pricing his product a little below the standard market price or using Exterior glue on Interior grades of plywood as added inducements to attract new customers.

IMPACT OF SOUTHERN PINE PLYWOOD MANUFACTURE ON THE SOFTWOOD PLYWOOD INDUSTRY

The way has already been paved for the entrance of Southern pine plywood manufacture into the softwood plywood industry. Extensive groundwork in research, the setting of commercial standards, and publicity has been laid. It has been reported that new Southern pine plywood plants may be established by the dozens in the next decade and that their production capacity might reach three billion square feet a year within a few years. If these predictions are realized, what will be the effects on the softwood plywood industry? Will softwood plywood prices drop considerably? Will any migration of plywood plants from the West to the South take place?

There may be no positive answers to these questions at the present time. However, tentative predictions may be made. The two new Southern pine plywood plants which are being established in the South by western corporations are not likely to have an immediate effect on softwood plywood prices. When the number of new plants increases considerably, the price level may be more difficult to maintain. From the standpoint of Southern producers, it is more desirable to maintain the price level so that the wide margin of freight differences can be turned into profit margin on the balance sheet.

The prospective increase in production capacity may very well be absorbed by the ever increasing demand for softwood plywood without causing a price decline. The market for softwood plywood has expanded eight times since 1940 and has doubled since 1955. Projecting from past records, the demand for softwood plywood in 1975 should be more than double today's market of nearly 10 billion square feet.

The South has two distinct advantages which no other regions can duplicate: proximity to major markets and extensive resources of Southern pine, which grows rapidly in the warm climate. Western firms, both large and small, presently are looking into opportunities for coming to the South. Large western firms with extensive facilities and strong financial backing are the logical ones to move first. Many small western firms, which produce mainly sheathing grades, are likely to suffer. In the competitive sheathing-grade market small western firms may have a more urgent need to get a foothold in the South than larger firms, but their success depends upon the ability to secure southern partners with substantial timber resources.